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Physical Geography of New Jersey. By ROLLIN D. SALISBURY; with an appendix by CORNELIUS CLARKSON VERMEULE. Being Vol. IV of the Final Report of the State Geologist. 8vo, pp. xvi + 170 + 200. Trenton, 1898.

New Jersey has set a good example for her sister states in the character and quality of the physiographic work set forth in this volume. Other states have made an enviable record in other lines of geologic work, but this is the first complete treatment of the physiography of a state we have had in America; and it is all the more notable for having as its author a specialist in physiography of the highest ability.

The plan of the work is, first, a plain statement of the facts of topography in detail, in the three natural topographic regions of the state, and second, the history of the topography.

The State of New Jersey, as a whole, is a part of the Atlantic slope, and though it is only 166 miles long, by about 40 miles wide, it includes portions of all the natural sub-provinces of this slope, *i. e.*, the coastal plain, the Piedmont plateau, and the Appalachian zone. Professor Salisbury shows that to this series another term should be added for the area under consideration, the series then reading from northwest to southeast; (1) *Appalachian zone*, of folded strata; (2) the *highland* area, of crystalline schists; (3) the *piedmont plain*, of Triassic rocks; (4) the *coastal plain*, of Cretaceous and younger strata, this last division covering a little more than the southern half of the state.

The members of this series all have their boundaries practically parallel with the Atlantic Coast, and as they differ widely in the nature of the materials from which they are built, the structure furnishes the natural basis for the division into zones, the topography being of the greatest importance in the interpretation of the geology. These four successive zones have a general slope to the southeast, directly across the structural boundaries, the inner or Appalachian zone having an average altitude of over 1500 feet, while the outer or coastal plain nowhere rises above 400 feet, by far the larger part of it being below 100 feet.

The Appalachian zone consists of early clastics, much folded, the axis of folding being northeast and southwest. Erosion has hollowed out broad valleys in the softer materials, and has left the harder beds standing up as long ridge-like mountains.

The second or Highlands area, made up of crystalline schists, does

not show the topographic regularity which the structure has imposed upon the inner zone, yet it has a deal of relief, being made of block-like mountain masses, flat-topped, of nearly equal elevation, nowhere rising into peaks, and separated by rather broad valleys, so giving an arrangement of two or three ranges of hills with the general northeast-southwest trend.

The third area, the Piedmont plain, has an undulating surface, sloping to southeast, yet interrupted by conspicuous ridges, one of which fronts the Hudson as the Palisades. These ridges are outcrops of trap, and represent dikes or flows of igneous rock.

The coastal plain is coincident with the Cretaceous and later deposits. In the description of all these zones, plates are given, showing various cross-sections drawn to scale, very helpful in getting a clear conception of the actual topographic conditions.

With such a complex structure, erosion has ever been busy, and by the differential erosion, and deposition, a basis is given by which the ever-varying attitude of the land is put on record. This very complex history Professor Salisbury and his assistants have deciphered for the long lapse of geologic time since the Triassic, so a tolerably connected history is given us from the beginning of Cretaceous time, and the ups and downs on record in this area give a very vivid conception of the instability of the earth's crust or the ocean level, or both.

There was a post-Triassic uplift when the Schooley peneplain was formed; then a Cretaceous subsidence and considerable deposits formed; then a slight post-Cretaceous uplift; then a Miocene submergence and more deposition; another elevation and the formation of the great Kittatinny and other valleys, and the emergence of the Palisades by differential erosion; another submergence—the Pensauken—when a broad sound extended from New York Bay southwest to the Chesapeake, and the coastal plain was only half above the sea, as a fringe of sandy islands; then a slight uplift and further erosion, during which time the glacial epoch brought its mantle of ice to the middle of the state, slightly masking the detail of the topography by erosion and deposition of drift; during which time also the southern half of the state was submerged; lastly, a postglacial elevation to present altitude.

This long record is made out by the most careful study of the physiography, by the intelligent mapping and correlation of a vast

mass of detail, and the whole interpretation stands as a monumental work in the young science of physiography.

The complexity of structure, the varying altitudes, the differential erosion, and the glacial interference have given many beautiful examples of readjusted drainage, some cases of which, *e. g.*, the Raritan and the Passaic, deserve to become classic.

The chief changes in postglacial time have been in the way of some readjustments of drainage in the drift, the beach action along the coast, and the building of dunes.

The whole of Part II, pp. 65-170 will be found a very valuable help to the teacher of physiography, and, for these pages alone, should be in every teacher's library. No plainer general statement of river action can be found than is here given (pp. 70-79).

The book is generously provided with maps of fine quality, with diagrams and sections, and with exceptionally clear half-tone insets of characteristic landscapes, all of which add very materially to the value of the work.

In the Appendix is collected a large mass of data, tables of geographical positions, of beachmarks, areas of drainage basins, forest areas, and tide tables. An account of the nationality and distribution of the population, and a statement of work accomplished in the magnetic survey closes the volume.

J. P. GOODE.

Bulletin of the American Museum of Natural History. Vol. X.
1898. New York.

Article IV. *A Complete Skeleton of Teleoceras fossiger. Notes upon the Growth and Sexual Characters of this Species.* By HENRY FAIRFIELD OSBORN.

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